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Exploring the potential of LiPS instruction for beginning readers

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The purpose of this study was to determine if phonemic awareness skills improved for first grade students classified as at-risk whose teachers used the Lindamood Phoneme Sequencing Program (LiPS; Lindamood & Lindamood, 1998). Students' scores on a Kindergarten screening tool (Learning Disabilities Working Committee - LDWC, 2005) were compared to their respective scores on a Grade One screening tool (LDWC, 2002). Comparison of progress for all students was evaluated as well as assessment of progress for students deemed at risk (below the 25th percentile) of reading failure compared to those not at risk (above the 25th percentile). Paired-sample t-tests were also used to determine if statistically significant differences existed between the means of phonemic identity, phonemic blending, and letter/sound identification between Kindergarten and Grade One. Results indicated that gains were made by all students in phonemic awareness and letter/sound correspondence; however, greater gains were noted for students deemed at-risk whose teachers used the LiPS program (Lindamood & Lindamood, 1998).

Introduction

Reading is a language skill required for individuals to be fully functional and independent (Bursuck, Munk, Nelson, & Curran, 2002; Nelson, Benner, & Gonzalez, 2005; Torgesen, 2000). Educational institutions and other government agencies respond to the need for children to become better readers by investigating, supporting, and adopting instructional practices to improve reading skills at the school level (Carlisle & Hiebert,

2004; National Reading Panel, 2000; Snow, Burns, & Griffin, 1998; Torgesen et al., 2001). Stages of early literacy development and recognition of basic skills for reading have been studied and described extensively (see review in Adams, 1990). Formal, direct instruction, recommended to begin in the early years of schooling, can prevent reading difficulties (Coyne, Kame'enui, Simmons, & Harn, 2004). Remediation of reading difficulties is enhanced by early identification efforts that recognize readers who are at-risk for reading failure (McNamara, Scissions, & Dahlen, 2005). Children considered at risk for reading failure are those whose low levels of achievement are indicated by scores from formal testing procedures (Snow et al., 1998). Specifically, readers who are considered *at-risk* score below the 20 to 25th percentile, depending on the stringency of the analysis (LDWC; Learning Disabilities Working Committee, 2005).

Phonemic awareness is fundamental to reading skills acquisition, and refers to the ability to notice, think about, and manipulate the individual sounds in spoken words (Abbott, Walton, & Greenwood, 2002). Children who perform poorly on oral language phonemic awareness tasks in kindergarten are very likely to experience difficulties acquiring early word reading skills (i.e., learning the relationship between letters and the sounds they represent in words, applying letter/sound correspondences to help them *sound out* unknown words). Early word reading skills provide the foundation for the growth of reading ability throughout elementary school (National Reading Panel, 2000). In a meta-analysis of 52 published studies on instruction in beginning reading, the National Reading Panel (NRP) found that phonemic awareness was a critical component of effective classroom instruction, regardless of whether the focus was prevention or intervention (see review in Ehri, Nunes, Willows, Schuster, Yaghoub-Zadeh, & Shanahan, 2001). Findings from evidence-based research show marked reductions in the incidence of reading failure when systematic and explicit instruction in phonemic awareness is provided by the classroom teacher (e.g., Bowman & Trieman, 2004; Cambourne, 2002; Snow et al., 1998; Torgesen, 2004).

Many programs have been developed to assist practitioners in teaching children to read – programs that target the development of phonemic awareness at an early age. One method of systematic instruction that targets phonemic awareness using deliberate teaching methods is the Lindamood Phoneme Sequencing Program for Reading, Spelling, and Speech (LiPS; Lindamood & Lindamood, 1998), previously called the Auditory Discrimination in Depth (ADD; Lindamood & Lindamood, 1975) program. This program, based on a sensory-cognitive processing philosophy, is intended to improve efficient and accurate word decoding and encoding (Lindamood & Lindamood, 1998). The implementation of the LiPS (Lindamood & Lindamood, 1998) or ADD program (Lindamood & Lindamood, 1975) and its effect on student outcomes in various word reading skills have been considered by numerous researchers (e.g., Pokorni, Worthington, & Jamison, 2004; Torgesen et al., 2001; Truch, 1994). For example, in a longitudinal study, Truch (1994) investigated how phonological awareness was affected by the ADD instructional approach (Lindamood & Lindamood, 1975). Pre-test and post-test data were collected on 281 participants (aged 5 to 55 years of age) who had received 80 hours of intensive one-on-one instruction following the scope and sequence of the ADD program. Results indicated that a treatment effect existed for the group of subjects, and highly significant gains were observed on measures of phonological awareness, sound/symbol connections, word identification, spelling, and decoding in context. However, this study only considered the phonemic awareness skills of one group of subjects; it did not incorporate a comparison group in its design that would monitor the effects of a control group or a group that received another treatment option.

Pokorni et al. (2004) conducted a comparison study of the LiPS (Lindamood & Lindamood, 1998), Earobics (Cognitive Concepts, Inc., 1998), and Fast ForWord (Scientific Learning Corporation, 1999) programs. The purpose of the study was to determine the effectiveness of three instructional methods that claim to improve “phonemic awareness, language, and reading-related skills” (Pokorni et al., 2004, p. 148). Sixty students (aged seven to nine years) with language and reading deficits were randomly assigned to one of the three interventions. Measures of phonemic awareness, and additional

language- and reading-related skills, were collected prior to and following the intervention. Pokorni et al. (2004) examined individual students' within and between group comparisons. Differences in program delivery included the intervention schedule, time allocated for intervention, and size of student groups. The measures used in a pre-test/post-test research format were identical for students in all treatment conditions. Pokorni et al. (2004) conducted multiple multivariate analyses of variance, and "found a significant effect of group in phonemic awareness only ... The LiPS intervention did a significantly better job than the other two interventions to improve students' ability to blend phonemes" (Pokorni et al., 2004, p. 155). The results from the phoneme segmentation, language, and reading tests did not show significant gains in student learning when comparing the instructional methods (Pokorni et al., 2004). However, analyses within each group noted significant gains on phonemic awareness skills made by students who received LiPS (Lindamood & Lindamood, 1998) instruction (Pokorni et al., 2004).

Torgesen, Alexander et al. (1999) also conducted a study where the effectiveness of three instructional programs was compared to a control group (NTC). The study's purpose was to determine what impact the conditions of instruction had on preventing reading difficulties in children. One treatment condition consisted of phonological awareness and phonics development (referred to as PASP) based on the ADD program (Lindamood & Lindamood, 1975). The second intervention was referred to as the Embedded Phonics (EP) program where phonics instruction occurred within the context of reading and writing exercises. Finally, the third condition supported regular instructional activities within the context of the regular classroom program (RCS). Participants were selected from a pool of students deemed at risk for reading failure in Kindergarten and provided 88 hours of one-on-one instruction until the end of second grade. Students assigned to the phonemically explicit condition using ADD, or the PASP treatment group (Lindamood & Lindamood, 1975), had "significantly stronger skills than those in the EP group in phonological awareness; phonemic decoding; and untimed, context-free word reading... children in the PASP group were also

stronger on word level reading skills than children in the RCS and NTC group" (Torgesen, Alexander et al., 1999, p. 589).

In a follow up study, Torgesen et al. (2001) randomly assigned 60 children with severe reading disabilities to two instructional programs (i.e., ADD and Embedded Phonics). Both of these programs "were phonemically explicit and systematic but varied in method of instruction and in depth and extent of phonemic practice" (Torgesen et al., 2001, p. 35). The ADD program (Lindamood & Lindamood, 1975) focused on developing phonemic awareness using articulatory cues and phoneme tracking of words, whereas the Embedded Phonics program developed phonic skills through reading and writing. All children received 67.5 hours of one-on-one instruction in two 50-minute sessions per day over an 8 week period. Pre- and post-measures of phonological awareness, rapid naming, memory, language, and reading-related skills were collected and analyzed. Results revealed that both instructional programs produced significant improvements in generalized reading skills that were stable over a 2-year follow-up period. The ADD treatment (Lindamood & Lindamood, 1975) produced greater gains in decoding, "reading accuracy and fluency of word reading in text" (Torgesen et al., 2001, p. 51) during intervention. However, it was acknowledged that "the overall pattern of growth in the treatment and follow-up periods indicates that the outcomes for the two methods were much more similar than different" (Torgesen et al., 2001, p. 51).

Other studies (Castiglioni-Spalten & Ehri, 2003; Wise, Ring, & Olson, 1999) have scrutinized instructional techniques, specifically incorporating the articulation emphasis promoted by Lindamood and Lindamood (1998). Castiglioni-Spalten and Ehri (2003) believed that "sensitizing children to phonetic articulatory properties of words will contribute to their word reading and spelling" (p. 27). Forty-five Kindergarten students (29 girls and 16 boys) who had no formal phonemic awareness or reading instruction, but were considered to be partially competent in letter knowledge, knowing 13 of 17 target letters, were included in the study.

Participants were assigned to either: (1) a group (mouth condition) that were trained to associate pictures of mouth positions with their corresponding sounds; (2) a group (ear condition) who were trained to associate coloured blocks with the segmented sounds in words; or (3) a control group who received no treatment condition (Castiglioni-Spalten & Ehri, 2003). The treatment group received six instructional sessions.

Results indicated that both the articulatory and auditory methods were effective in improving phonemic awareness (PA) and spelling skills. However, only the mouth condition demonstrated improvements on the reading tasks administered as a post-test immediately following intervention and again, one week later. Based on the results, the researchers suggested:

"If children need to gain articulatory awareness for PA instruction to be completely effective and to have maximum transfer value, then teaching this ingredient explicitly is the best way to ensure that it is learned. If the articulatory method proves to be more engaging and motivating than the ear method, as our results suggested, then teachers may have an easier time teaching PA if they use mouth pictures. Finally, if articulatory training facilitates the connection forming process in remembering how to read words, then teaching PA in this way may exert a bigger impact on sight word learning." (Castiglioni-Spalten & Ehri, 2003, p. 49)

This study supported phonemic awareness development emphasized by articulation, but was limited by sample size, gender composition, and long-term measurable outcomes of phonemic awareness (Castiglioni-Spalten & Ehri, 2003). Wise et al. (1999) addressed some of these concerns in their study.

Wise et al. (1999) also attempted to examine the effects of "articulatory awareness and phoneme manipulation" (p. 275). Wise et al. (1999) compared "two conditions... the phonological awareness with and without articulatory awareness conditions... [and] included two additional conditions: a condition that trained articulatory awareness

and phonics without exercises in phonemic/letter manipulation, and regular-instruction control condition" (p. 276). The 122 participants, aged 7 to 11 years, were selected for the study based on achievement scores below the 10th percentile on standardized reading pre-tests, and were of average intelligence. Student progress was evaluated using measures of: word recognition; phonological decoding; phoneme awareness; nonword repetition; orthographic coding; spelling; reading comprehension; and arithmetic skills before, during, and following intervention, and then again one year later. Researchers detailed the instructional conditions that were common and/or unique to each treatment group and analyzed the results. Wise *et al.* (1999) acknowledged that gains were notable in all treatment conditions.

These results are empowering for teachers. They suggest that teachers should learn about language, reading, and children's learning strengths and weaknesses; and then tailor the methods they learn to meet the needs of students and to account for the teachers' own strengths, knowledge, and experience. (Wise *et al.*, 1999, p. 301) Wise *et al.* (1999) summarized their recommendations for practitioners to include elements of phonological awareness, phonics instruction, sounding out, and self-correction of errors when reading, all of which are an integral part of the LiPS program (Lindamood & Lindamood, 1998).

Several research studies supported the effectiveness of the LiPS program (Lindamood & Lindamood, 1998) and the learning theories on which it is based (e.g., Pokorni *et al.*, 2004; Torgesen *et al.*, 2001, Truch, 1994). The instructional components of the program are intended to promote higher level thinking for meta-linguistic analysis, and the levels of progression target phonemic awareness improvement along a developmental continuum (Lindamood & Lindamood, 1998). Research has indicated that children who receive LiPS (Lindamood & Lindamood, 1998) instruction as early intervention (Torgesen, Alexander *et al.*, 1999) or remediation (Truch, 1994) made gains in their abilities to manipulate phonemes, and these abilities impacted on reading skills (Castiglionis-Spalten & Ehri, 2003). No published research studies were found that considered a whole group instructional setting and the extent of influence of instructional approach on student achievement in phonemic

awareness and reading acquisition. There is considerable need for further evaluation of program implementation in classroom settings. This would assist teachers and support personnel in their efforts to effectively and efficiently teach children to read. Therefore, this study set out to address whether the LiPS program (Lindamood & Lindamood, 1998) can effect change in the phonemic awareness skills of students classified as at-risk for reading failure.

The purpose of this study was to determine the effectiveness of the LiPS program (Lindamood & Lindamood, 1998) in improving phonemic awareness skills for first grade students. Specifically, this study investigated the effect of the LiPS program (Lindamood & Lindamood, 1998) on the phonemic awareness skills of typically achieving students and students classified as at-risk for reading failure between Kindergarten and Grade One.

Methodology

The purpose of this study was to describe the extent of change in the phonemic awareness skills of children from Kindergarten to Grade One who received instruction using the Lindamood Phoneme Sequencing method (LiPS; Lindamood & Lindamood, 1998). The treatment, assessment, and instructional methodology administered by teachers in this study were endorsed by their school district as an early literacy initiative. The following research questions guided the study: (1) What is the effect of the LiPS program on students' phonemic awareness skills between Kindergarten and Grade One? (2) What is the effect of the LiPS program on the phonemic awareness skills of students classified as *at-risk* between Kindergarten and Grade One?

Participants

Forty-five Grade One teachers of single or multi-graded classrooms, who were employed by a rural school division in central Saskatchewan, were invited to participate in this study. Of the eligible participants, 16 teachers agreed to participate in the study. Scores on the pre- and post-

test measures included 227 students who were instructed by the teachers who volunteered to participate in this study.

Instrumentation

The Kindergarten Screening Tool (LDWC, 2005) and the Grade One Screening Tool (LDWC, 2002) were used to gather information on student achievement in phonological awareness. Permission to use the instruments for this study was granted by the authors, the Learning Disabilities Working Committee (LDWC). The LDWC is a group of educators in a large rural school division in Saskatchewan. Committee members strive to support teachers in strengthening classroom instruction in language arts to ensure equal opportunities for students who experience learning difficulties. The screening tools were developed by LDWC for early identification of reading difficulties, and used to measure student progress in a longitudinal study (McNamara et al., 2005). The Kindergarten Screening Tool (LDWC, 2005) has been administered to over 500 students each year for five years, while the Grade One Screening Tool (LDWC, 2002) has been available to teachers for four years prior to the start of the current study. Demographic variables, such as age and gender, were included in both of the student assessment instruments.

Common Screening Tasks

Sub-tests common in both screening tools tested phoneme identity, phoneme blending, symbol recognition of upper case and lower case letters, and sound-symbol association for lower case letters only. The phoneme identity task in the Kindergarten Screening Tool (LDWC, 2005) and the Grade One Screening Tool (LDWC, 2002) each included 15 items that identified consonant and vowel phonemes. Possible scores on this task range from 0 to 15. Scripted directions and a model were provided for the teacher as a part of the screening tools. For each item, the teacher read a sentence of eight words or less, and then asked the child to repeat the sentence. A phoneme was identified and the child was asked to repeat the sound. Finally, the teacher supplied two words that were similarly phonetically structured and asked the child to identify which

word contained the identified phoneme (e.g., "His chin is too thin"). The child repeated the sentence. The teacher then identified a phoneme and asked the child to repeat the sound (e.g., "Now say /ch/"). Finally, the teacher asked the child to identify in which word the phoneme is present (e.g., "Do you hear /ch/ in chin or thin?"). This process was repeated for each item as questions became progressively more difficult.

Phoneme blending included directions for teachers to administer eight items, with a maximum length of four sounds to Kindergarten students, and 12 items with up to five sounds to Grade One students. Possible scores on this task range from 0 to 8 and 0 to 12, respectively. The teacher segmented the phonemes of a word and asked the student to put the sounds together to make a word (e.g., "If I say /p/ /i/ /g/ the word is ...[pig]"). In the letter recognition task, stimulus sheets that contained all letters of the alphabet were provided to the student. The teacher pointed to an upper case or lower case letter and asked the child to identify its name. Children were also required to identify the sound made by lower case letters only. Possible scores on this task range from 0 to 100 percent.

Grade Specific Screening Tasks

Both the Kindergarten Screening Tool (LDWC, 2005) and the Grade One Screening Tool (LDWC, 2002) also contained grade specific tasks. Specific to the Kindergarten screening tool (LDWC, 2005) was a sub-test of rhyming words. Following instruction and model administration, children were asked to determine if two words rhymed by giving a yes/no response. For example, the words /boy/ and /toy/ were given and the child determined if they rhymed, and responded *yes* or *no*. Possible scores on this task range from 0 to 20.

The Grade One Screening Tool (LDWC, 2002) also contained additional sub-tests that were age-appropriate, based on levels of phonemic development. Phoneme segmenting involved the test administrator saying a word and asking the student to segment the phonemes. For example, the teacher said, "Say the word *dog*. Now say the sounds in *dog*." The student responded by segmenting the phonemes, "/d/ /o/ /g/." This sub-test included 15 items, up to a maximum length of five

phonemes. Possible scores on this task range from 0 to 15. The final task for Grade One students included a list of 20 words where students were asked to read each word. Possible scores on this task range from 0 to 20. This task measured their sight word knowledge – reading proficiency – as opposed to their ability to segment and blend words, as indicated in the scoring note to teachers on the word reading protocol page.

The research team (McNamara et al., 2005) responsible for designing this instrument, in conjunction with practitioners who were administering the assessment in the early stages of test development, began to collect evidence regarding its content validity. In a pilot study, examination by teachers and reading specialists was considered for the appropriateness of instrument format, content, representation of sample items, and student performance (M. Scissons, personal communication, March 6, 2006). The internal consistency (Cronbach's coefficient alpha) for the entire Kindergarten inventory was .8239 (J. K. McNamara, personal communication, November 24, 2005). The internal consistency of each sub-test, determined using a split half technique, was as follows: phoneme identity ($r = .82$); phoneme blending ($r = .78$); rhyming ($r = .79$); upper case letter identity ($r = .91$); lower case letter identity ($r = .90$); and letter sounds ($r = .89$).

In the longitudinal study (McNamara et al., 2005) for which this assessment was designed, the researchers indicated that high within-grade correlations ranged from .29 to .93 for Kindergarten and .37 to .70 for Grade One. The across grade correlations ranged from low to moderately high (i.e., .16 to .57; McNamara et al., 2005). Test reliability was unknown for the Grade One assessment tool, but it is believed to have similar content validity to the Kindergarten protocol (J. K. McNamara, personal communication, November 24, 2005).

Data Collection

The early literacy initiative advocated by the school division participating in this study had been ongoing for five years, and many primary teachers within the jurisdiction were practicing the teaching strategy under study. Grade One teachers who wished to participate

were asked to complete and return a provided consent form. Parents of students in the classes being examined were informed of the proceedings and an informational letter was distributed. Any documentation identifying the teachers or students by name and their assigned code number was kept separate from their questionnaire responses. This study was reviewed and approved by the appropriate research ethics board. All participation was voluntary.

Kindergarten teachers in this school division, trained by test developers, administered the phonological awareness tasks and the letter/sound identification sub-test of the screening tool before the end of the school year (i.e., May). Teachers recorded the raw data on a summary sheet and forwarded them to the school division office. In May of the following year the same procedure, administered by the Grade One teachers who volunteered for this study, was repeated using the Grade One Screening Tool (LDWC, 2002). The Kindergarten and Grade One screening results for students of the 16 Grade One teachers who agreed to participate in this study were numerically coded and forwarded to the researcher.

Data Analysis

Data were entered and analyzed using the Statistical Package for the Social Sciences (SPSS). Conducting frequency distributions showing minimum and maximum range for each variable provided a quality check of the data to verify that all entered data were not outside the expected range of scores for each sub-test. After initial data entry, a quality check to ensure accuracy was conducted by four individuals who randomly selected a minimum of 20% of student scores and demographic data in each class. Cases were monitored for missing data after students and teachers had been numerically coded. Data analyses with both missing data and average scores substituted for missing data were conducted to check if the findings would be adversely affected by missing data. No changes to significance occurred when analyses with missing data and average score substitutions were compared. Therefore, all reported analyses were completed with missing data.

Student achievement and demographic information collected from the screening instruments included both categorical (i.e., age and gender) and continuous variables (i.e., phonemic awareness skills and letter/sound identification). Once the data were collected and analysis began, it was observed that the pilot Kindergarten Screening Tool (LDWC, 2005) had 20 rhyming items as opposed to 15 items in the published copy. Since data were collected based on the pilot study the previous year, analyses were based on the data from the 20 items tested. Each research question guided the analyses employed for the study. Levene's Test for Equality of Variance was an additional method employed due to the nonnormality of the data used for analyses in the current study.

Research Question 1

The first research question posed was: what is the effect of the LiPS program (Lindamood & Lindamood, 1998) on students' phonemic awareness skills between Kindergarten and Grade One? First, the pre- and post-means for each screening sub-task were compared to determine if there was a change in phonemic awareness skills of children during their first grade year. Descriptive analyses that included measures of central tendency and variability were conducted. A t-test for dependent means was used to compare means of the student screening.

Research Question 2

The second research question posed was: what is the effect of the LiPS program (Lindamood & Lindamood, 1998) on the phonemic awareness skills of students categorized as *at-risk* between Kindergarten and Grade One? Descriptive statistics that included measures of central tendency and variability, as well as t-tests to compare means, were employed for analyzing the change in phonemic awareness and letter/sound identification of Grade One students classified as *at-risk*. Those students who scored in the lowest quartile of any sub-test of phonological awareness or letter/sound identification in their Kindergarten year were considered *at-risk* and those scores were included for these analyses. Comparisons were also noted for those students considered *not at-risk* of

reading failure who scored above the 25th percentile on the Kindergarten screening tool.

Results

The purpose of this study was to determine if phonemic awareness skills improved for first grade students of teachers who used the LiPS program (Lindamood & Lindamood, 1998). Sixteen Grade One teachers in one rural school division participated in the study. At the end of the school year, participating teachers administered an individual assessment of phonemic awareness, word reading, and letter/sound identification to the 227 students in their classes. Specifically, the mean scores of sub-tests on a Grade One screening were compared to mean scores of sub-tests that assessed the same skills one year earlier on a Kindergarten screening assessment. The sub-tests used in these analyses included two areas: phonemic awareness; and letter/sound identification. A comparison of the entire student sample was conducted, and then an *at-risk* group was identified and the mean scores were examined.

Research Question 1 Results

The first research question posed was: what is the effect of the LiPS program (Lindamood & Lindamood, 1998) on students' phonemic awareness skills between Kindergarten and Grade One? In order to determine the change in phonemic awareness skills from Kindergarten to Grade One, means and frequencies of the raw scores from components of the Kindergarten screening and Grade One screening assessments were analyzed. Since phonemic awareness skills and letter/sound knowledge are believed to predict later reading success, assessment of both areas were included in the study. However, only those sub-tests that were common to both the Kindergarten and Grade One screening tools were used in the analyses. Therefore, assessment of phonemic awareness included phoneme identity and phoneme blending. Letter identification, both upper and lower case, was assessed and converted to a percentage. Likewise, sound identification in lower case format was assessed and scores also converted to a percentage. In order to calculate statistical significance, a paired-sample t-test was used to compare the

extent of change on the common five sub-tests of phonemic awareness and letter/sound identification. Besides the mean and standard deviation, the median is also reported since the distributions of scores were negatively skewed (see Table 1).

Table 1
Comparison of Phonemic Awareness Sub-tests on Kindergarten and Grade One Screening Assessments

Phonemic Awareness Sub-test	Kindergarten			Grade One		
	N = 225	Median	Mean	SD	Median	Mean
Phoneme Identity*	12	11.73 (15)	2.59	15	14.32 (15)	1.11
Phoneme Blending*	6	5.17 (8)	2.52	12	11.24 (12)	1.36

Note. SD = Standard Deviation; N = sample size. Maximum possible score of task in parentheses.

* $p < .05$

Results revealed that the mean score of phoneme identity increased from Kindergarten to Grade One. There was a statistically significant difference between student scores of phoneme identity in Kindergarten and Grade One [$t (178) = -13.715$, $p < .05$, $\eta^2 = 0.5138$]. The medium effect size, as defined by Cohen (1988), and increased scores suggested practical significance (i.e., an observed difference which has meaning or practical use in the real world). Assessment of phoneme blending demonstrated an increase between Kindergarten and Grade One. A statistically significant difference was found between the mean scores in the pre-test/post-test study [$t (179) = -33.494$, $p < .05$, $\eta^2 = 0.8624$]. Cohen (1988) identified an η^2 of 0.80 as a large effect size. The large effect size and increased scores also suggested a practical significance.

Increased knowledge of letter identification and letter/sound correspondence was also measured. Again, the median is reported due to negative skewness of scores as well as the mean and standard deviation (see Table 2). Mean percentage scores for upper case letter identification increased from Kindergarten to Grade One. There was a statistically significant difference between student scores of upper case

letter identification in Kindergarten and Grade One [$t(179) = -5.661, p < .05, \eta^2 = 0.1519$]. Cohen (1988) identified an η^2 of 0.20 as a small effect size. Even though this effect size was small, the increase in means suggests that the significance was practical. The results were similar for lower case identification as mean scores increased between Kindergarten and Grade One. As was the case for upper case letter identification, the change in mean scores of lower case letter identification was found to be statistically significant [$t(179) = -7.609, p < .05, \eta^2 = 0.2444$]. Even though the effect size was small, the increase in mean scores still indicates a practical significance. In regards to letter/sound correspondence, a statistically significant difference was also found in the dependent paired sample [$t(178) = -10.972, p < .05, \eta^2 = 0.4034$]. Cohen (1988) identified an η^2 of 0.40 as a medium effect size. Again, the medium effect size and increased means support a practical significance. It is important to recognize that other factors may also have influenced student performance on these tasks (i.e., maturation). These possible factors will be considered in the discussion.

Table 2
Comparison of Letter/Sound Identification in Kindergarten and Grade One

Letter/sound Identification Sub-tests	Kindergarten				Grade One			
	N	Media n %	Mean %	SD	N	Media n %	Mean %	SD
Upper case Letter Identification*	226	100.00	86.10	23.42	220	100.00	98.63	7.30
Lower case Letter Identification*	227	92.31	81.04	26.24	220	100.00	98.10	7.42
Letter/sound Correspondence*	225	80.00	70.57	29.17	220	100.00	96.09	8.74

Note. SD = Standard Deviation; N = sample size; % = percentage. Maximum possible score of task in parentheses.

* $p < .05$

Research Question 2 Results

The second research question posed was: what is the effect of the LiPS program (Lindamood & Lindamood, 1998) on the phonemic awareness skills of students considered *at-risk* for reading difficulties between Kindergarten and Grade One? In order to investigate phonemic awareness skills of Grade One students, the student data set was subdivided based on *at-risk* identification in Kindergarten. A score below the 25th percentile cut-off on any one of the Kindergarten screening sub-tests categorized students as *at-risk* for reading failure. The progress of this group of students was further analyzed in Grade One.

Data analysis of the sub-group deemed *at-risk* was identical to the procedure used to answer the first research question posed in this study. Differences in means and frequencies of raw scores from five sub-tests (i.e., phoneme identity, phoneme blending, upper and lower case letter identification, and lower case letter/sound correspondence) that tested skills in both Kindergarten and Grade One were analyzed. Statistical significance of the common sub-tests of the screening tools was calculated using a paired-sample t-test (i.e., to compare the extent of change in phonemic awareness and letter/sound identification). The analyses were extended to include the comparison of student scores that were not at risk for reading difficulties. Additional analyses and comparisons were allowed when analyzing the scores of students who were deemed *at-risk* and *not at-risk* for reading difficulties. The results of the assessment of phonemic awareness and letter/sound identification of students deemed at risk for reading difficulties on each of the screening assessments conducted during Kindergarten and Grade One is summarized in Table 3. The results of students who achieved raw scores above the 25th percentile on all sub-tests in their Kindergarten year, and were therefore classified as *not at-risk* for reading failure, are summarized in Table 4.

Five sub-tests common to both screening tools (i.e., phonemic identity, phonemic blending, upper and lower case letter identification, and lower case sound identification) were examined separately as they relate to the students deemed *at-risk* and those students whose scores were

considered typical in achievement. In analyzing phonemic identity where 15 items were assessed, the mean score reported in Kindergarten for the *at-risk* and *not at-risk* groups increased in Grade One. Results indicated that there was a statistically significant difference between

Table 3
Comparison of Phonemic Awareness and Letter/Sound Identification Sub-tests on At-Risk Sub-groups

Sub-Test	At-Risk					
	Kindergarten (N = 111)			Grade One (N = 79)		
	Median	Mean	SD	Median	Mean	SD
Phoneme Identity	10.00	10.14 (15)	2.65	14.00	14.05 (15)	1.21
Phoneme Blending	3.00	3.73 (8)	2.65	12.00	10.90 (12)	1.77
Upper Case Letter Identification (%)	84.62	74.68	27.26	100	97.89	8.69
Lower Case Letter Identification (%)	76.92	68.48	29.47	100	97.36	8.62
Lower Case Letter/sound Correspondence (%)	50.00	51.71	29.61	96.15	94.63	10.34

Note. SD = Standard Deviation; N = sample size; % percentage. Maximum possible score of task in parentheses.

Table 4
Comparison of Phonemic Awareness and Letter/sound Identification Sub-tests on Not At-Risk Sub-groups

Sub-Test	Not At-Risk					
	Kindergarten (N = 113)			Grade One (N = 99)		
	Median	Mean	SD	Median	Mean	SD
Phoneme Identity	13.00	13.00 (15)	1.69	15.00	14.56 (15)	.97
Phoneme Blending	6.36	6.38 (8)	1.63	12.00	11.51 (12)	.86
Upper Case Letter Identification (%)	100	98.36	4.02	100	99.02	7.49
Lower Case Letter Identification (%)	100	95.06	7.62	100	98.67	7.57
Lower Case Letter/sound Correspondence (%)	92.31	89.13	11.88	100	97.50	7.98

Note. SD = Standard Deviation; N = sample size; % percentage. Maximum possible score of task in parentheses.

student scores of phoneme identity in Kindergarten and Grade One for *at-risk* [$t(78) = -12.970, p <.05, \eta^2 = .6832$] and *not at-risk* [$t(98) = -8.329, p <.05, \eta^2 = .4145$] groups. The medium effect sizes indicated by the significant change in means for *at-risk* and *not at-risk* students also suggest a practical significance.

The Kindergarten phonemic blending sub-test assessed eight items, and the Grade One sub-test assessed 12 items. Increased mean scores indicated both statistical and practical significance for the *at-risk* sub-group between Kindergarten and Grade One [$t(78) = -23.622, p <.05, \eta^2 = .8774$]. The *not at-risk* sub-group measured means increased from Kindergarten to Grade One. A statistically significant difference was observed by the paired-sample t-test, [$t(98) = -30.372, p <.05, \eta^2 = .9040$]. Noteworthy is the large effect sizes of both t-tests.

In analyzing the upper case letter identification sub-test, mean scores for the *at-risk* sub-group in Kindergarten increased in Grade One. Although the effect size was small, the paired-sample t-test revealed a statistically significant difference, [$t(78) = -6.206, p <.05, \eta^2 = .3305$], also considered a practical significance. Although there was an observed change in the same sub-test of the typically achieving students, there was no statistically significant difference, [$t(98) = -.749, p >.05, ns$].

Differences in lower case letter identification of Kindergarten students were noted. The Grade One assessment revealed increased means for *at-risk* and *not at-risk* sub-groups. A paired-sample t-test measured a statistically significant difference with a medium effect size in the *at-risk* sub-group [$t(78) = -7.541, p <.05, \eta^2 = .4217$], and the change is deemed a practical significance. Although a statistically significant difference in lower case letter identification was also noted in the group of typically achieving students, the effect size was very small; [$t(98) = -3.478, p <.05, \eta^2 = .0110$], which suggests that the significance is not practical.

The final analysis related to this research question was based on student knowledge of letter/sound correspondence. As was the case with lower case letter identification, a statistically significant difference was found

for letter/sound correspondence of the students deemed *at-risk*, [$t(78) = -11.137$, $p <.05$, $\eta^2 = .6139$], as scores increased from Kindergarten to Grade One. Although considered a statistically significant difference by the paired-sample t-test, [$t(98) = -6.275$, $p <.05$, $\eta^2 = .2867$] for students considered *not at-risk* for reading difficulties, the effect size was small as compared to the medium effect size in the *at-risk* sub-group. In consideration of the importance for mastery of letter/sound correspondence for beginning reading, the increased means, statistical significance, and effect size contribute to a practical significance.

Discussion

The purpose of this study was to measure the change in phonemic awareness skills of Grade One students compared to their scores from a screening tool administered in Kindergarten. Observations included students considered typical achievers and students who were considered *at-risk* for reading difficulties. In order to determine if there was student reading growth, scores from a screening tool administered in Kindergarten were compared to scores from a Grade One screening tool. Students demonstrated gains in phonemic awareness and letter/sound correspondence in classrooms where teachers used the LiPS program (Lindamood & Lindamood, 1998). Specifically, students considered *at-risk* for reading failure made gains greater than those students who were considered *not at-risk* for reading failure in phonemic awareness and letter/sound association in classrooms where teachers used the LiPS program (Lindamood & Lindamood, 1998).

Reading Achievement in Decoding

The analyses considered raw data of student scores on two phoneme sub-tests, identity and blending. Data were collected on other sub-tests (e.g., rhyming, phoneme segmenting, and word reading) but, since they were not common to both screening assessments, they were not used in the analyses. Letter and sound recognition sub-test results did not use data that measured the actual letters known, but rather raw data were converted to the known percentage of letters/sounds assessed. The purpose of the conversion was due to the need to standardize the scores.

In some cases, when data were collected in Kindergarten, some teachers only tested the letters they had directly taught, which may have been less than 26 letters and sounds. Similarly, some Grade One teachers assessed their students' extended identification of sounds, specifically the soft *g* and *c*, which then made 28 sounds.

Analyses revealed significant growth of student achievement on all phonemic and letter/sound recognition sub-tests from Kindergarten to Grade One. Results support the constructs of reading deficit prevention and suggest that the LiPS (Lindamood & Lindamood, 1998) instruction method may have a positive impact on the change in phonemic awareness skills in Kindergarten and Grade One. However, it is important to recognize other factors that may have influenced performance. These factors include: (1) maturation; (2) desensitization to test taking; and (3) multiple treatment interference, such as the use of other instructional approaches.

Snow et al. (1998) argued that the basic skills of reading include "mapping the letters and the spellings of words onto the sounds and speech units they represent" (p.321). Essentially, the basic skills of reading are defined by phonemic awareness. Phonemic awareness was described by Abbott, Walton, and Greenwood (2002) as the ability to identify, order, and manipulate speech sounds, then link those sounds to written language. The assessment tools that were used in this study demonstrated the need to teach directly, explicitly, and systematically the phonemic awareness and letter/sound recognition skills necessary for students to advance their reading skills toward reading for meaning. Furthermore, the progressive skill development, as outlined by Bowman and Treiman (2004) and Scarborough (2001), that have been the foundation of early literacy initiatives, have also been supported by the screening tools developed by McNamara et al. (2005) that were used as measurement instruments for the current research. The inclusion of sub-tests and the increased levels of expectations from Kindergarten to Grade One in the measurement instruments, such as phonemic identity, blending, and segmenting, demonstrated progressive skill development of phonemic and phonological awareness. The fact that consistently statistically significant gains were made in phonemic awareness and

letter/sound association of beginning readers within a year support continued emphasis of directly teaching basic skills that promote early literacy development. The LiPS program (Lindamood & Lindamood, 1998) is based on the principles of best practice, phonemic awareness development, and letter/sound association. Teachers who participated in the study reported they used the LiPS program (Lindamood & Lindamood, 1998). However, teachers were not asked to report the extent (i.e., all or parts) to which the program was used in their instructional practices.

Reading Achievement in Decoding: Group Comparison

As was the case for reading achievement in decoding of the entire student sample, student outcomes in the assessed sub-skills were even greater for students identified at-risk for reading failure. Mean scores of students at-risk for reading failure made not only statistically significant gains in all areas commonly assessed in the Kindergarten and Grade One screening tools, but made greater gains than the students who scored above the 25th percentile on all sub-tests (i.e., students considered *not at-risk*). In fact, mean scores on the Grade One screening sub-tests for students classified as *at-risk* fell within the normal range of scores, which were considered above the 25th percentile. Therefore, even more than typically achieving students, the results of the current study demonstrated support for instructional methods that target phonemic awareness and letter/sound association for those students who demonstrate difficulty in learning to read at a beginning level.

For purposes of this study, the cut-off scores used to designate those students considered at risk for reading failure were based on those reported by McNamara et al. (2005). Their study was specifically related to early identification indicators of reading difficulties. Since the sample sizes of students' scores was larger and extended over several years of data collecting, reliability of those scores is more accurate. However, an analysis of percentiles based on the student scores in the present data set returned similar results on some sub-tests. For example, letter/sound correspondence cut-off was 50%, identical to the results of McNamara et al. (2005), as was the rhyming of phonemes, with the 25th percentile cut-

off measuring 14 out of 20 items. Differences existed in the other four sub-tests. McNamara et al. (2005) suggested the cut-off score for phoneme identity to be 7 out of 15, phoneme blending was 2 out of 8, upper case letter identification was 75%, and lower case letter identification was 65%. The present study revealed that 10 out of 15 correct items on phoneme identity, 3 out of 8 on phoneme blending, 81% of upper case letter identification, and 73% of lower case letter identification were the measures at the 25th percentile based on the present group of student scores. The low sub-test ceilings on some of these tasks (i.e., 81% upper case identification is at the 25th percentile) do not mean that they are less than ideal for the purpose for which they were designed. The tasks were administered in the last part of the school year in both Kindergarten and Grade One (i.e., May). Typically developing students would have been exposed to the skills assessed by these tasks throughout the year, and would be expected to have higher level scores on them by the end of the school year.

The congruency of cut-off scores in the current study, and the scores reported by McNamara et al. (2005), provide further support for the reliability and validity of the screening tools designed for the longitudinal study. The increased mean scores may indicate that, since the early literacy initiative began in the given school jurisdiction, the increased emphasis and support to programming at the Kindergarten level have increased student achievement in the years that followed.

Analyses of scores that designated students at risk for reading failure are further supported by researchers who have suggested that early identification, intervention, and the LiPS (Lindamood & Lindamood, 1998) instructional method are critical in the adoption of best practices. McNamara et al. (2005), Snow et al. (1998), and Vellutino et al. (1996) suggested that early identification of reading difficulties is a means to implementing appropriate prevention and early intervention strategies. These intervention strategies are likely to increase the probability of future reading success for struggling beginning readers (Coyne, Kame'enui, Simmons, & Harn, 2004; Lennon & Slesinski, 1999; Scanlon & Vellutino, 1997).

The LiPS program (Lindamood & Lindamood, 1998) has been effective in developing phonemic awareness, as reported by Torgesen and his research teams (1999; 2000; 2001; 2004), as well as Truch (1994), and Lindamood and Lindamood (1998). Castiglioni-Spalten and Ehri (2003) also suggested that the development of these phonological skills has an impact on reading. The results of the current research confirmed their findings. However, practitioners and stakeholders must be cognizant that other influential factors may also have contributed to the increase in student performance (i.e., maturation, multiple treatment interference).

It is clear that the practice of this school district and its teachers has substantial data to support their efforts in maintaining best practice and early literacy initiatives. Early identification and intervention of critical reading components, such as phonemic awareness and letter/sound identification, have positively impacted on reading achievement in decoding among all Grade One students, but particularly those students who were considered *at-risk* in Kindergarten.

Limitations

The first limitation of the study was that data cannot be generalized to other Grade One teachers and their students as it only includes a target sample of teachers and students from one rural school division. The sample size included 36% of the teachers invited to participate, those of whom teach in one rural school division located in central Saskatchewan. Since a larger sample is more representative of a population, the small sample size and the distribution of scores limited the scope of generalization.

Second, other factors, such as individual teacher delivery styles and/or use of other instructional methods, may affect children's phonemic awareness development. Data regarding instructional practice were not collected. Monitoring the fidelity of program implementation was not included in the present study.

Third, individual students' level of cognitive functioning was an unknown factor that could influence final results of reading skills

acquisition. Typically, cognitive deficits are believed to delay learning to read. There were no measures in place to eliminate cases where the level of learning expected for this age would have been inappropriate.

Finally, the fact that the study was not longitudinal means that monitoring of transferable skills was restricted. The short term project only allowed measurement of specific subskills that are believed to be predictive of reading success. Therefore, one should consider that specific skills may be improved, but that this may not translate into reading achievement within a typical range.

Conclusion

The current research has explored the impact of LiPS instruction (Lindamood & Lindamood, 1998) on beginning readers. The beginning stages of learning to read can be supported by consideration of the constructs of reading deficit prevention. That is, by implementing best practice which incorporates key reading components, such as alphabetic, principle instructional practices, and explicit and systematic instruction, teachers can positively impact on beginning reading acquisition. Principles of early literacy, identification, and intervention, are critical to preventing reading failure, and are effective in reducing remediation of reading difficulties in the higher grades. A primary skill required by beginning readers is the development of phonemic awareness - the ability to identify and manipulate individual sounds in words.

One instructional program, called LiPS (Lindamood & Lindamood, 1998) incorporates the constructs of reading deficit prevention. The intended outcome of the program is to target phonemic awareness development through five levels of progression, each of which is presented through critical instructional practices. The LiPS program (Lindamood & Lindamood, 1998) is an effective program that has proven to impact on beginning reading acquisition.

The questions posed in the present study determined that phonemic awareness changed from Kindergarten to Grade One, particularly for

students at-risk of reading failure. However, teacher perception, knowledge, and demographics are also critical factors that impact on student achievement. The results of this research contribute to the existing body of research that supports explicit and systematic instruction of phonemic awareness skills at the primary level by well-trained teachers.

Implications for Practice

Instruction at a classroom level has proved to be effective in identifying students deemed *at-risk* for reading failure who received appropriate and timely intervention. As a result, a large percentage of those students' scores were within a typical range of achievement. Primary prevention at a classroom level appears to be cost-effective and efficient in meeting the needs of students. Student achievement scores in areas of phonemic awareness and letter/sound correspondence for all students, and particularly those students considered at risk for reading failure, when teachers employed the LiPS program (Lindamood & Lindamood, 1998), made significant gains. The approach to teaching these skills is direct, explicit, and systematic instruction that takes place at the primary reading level. This early literacy initiative has proved to be *best practice* and requires continued support through a variety of regular professional development forums and sustained efforts in data collection. Instructional methods like LiPS (Lindamood & Lindamood, 1998) are effective in identifying those students who struggle learning to read, remediating those difficulties quickly; then concerted effort can be directed to the percentage of students who truly require secondary and tertiary levels of reading instruction. The relationship between teaching experience, specified and specialized training, and student reading outcomes has practical implications for district administration. First, as already noted, enhanced professional development specific to instructional approaches needs to be financially supported. Second, hiring practices may include the consideration of candidates whose experience and specialized training would impact on primary reading achievement and effect positive long term student outcomes.

For primary reading teachers to be adequately prepared to teach students, formal reading training at pre-service and in-service levels needs to be improved and/or maintained. The theoretical underpinnings of reading development are required for teachers to implement instructional approaches that are effective in teaching children to read.

Implications for Future Research

There is a limited amount of published research regarding the effectiveness of programs that target phonemic awareness delivered within the context of the classroom. This suggests the need for further carefully designed research to evaluate the efficacy of instructional strategies as they apply to a primary education level. This approach to research would provide opportunities to define differences between treatments. For example, comparisons of student achievement may be made between programs endorsed by different jurisdictions or even varied program adoption within a region. If studied within the context of whole group instruction, research results would include rates of student progress in addition to different treatment effects.

With the screening tools already developed, acceptable levels of test reliability, and data collection methods established, continued data collation from these instruments would provide data that would extend over a longer period than one year. Continued development of assessment practices that continue to track the progress of students throughout the stages of reading development would provide a wealth of information to inform decisions about best practice, effective instruction, and literacy development. For those children who continue to struggle beyond the primary prevention level, who did not respond adequately to universal instruction, further research of the effectiveness of LiPS (Lindamood & Lindamood, 1998) delivered at secondary and tertiary levels may be beneficial. If overall progress and/or transferability of skills have not been readily observed, seeking answers to questions regarding the effects of more intensive group instruction and intensive instruction in other settings is recommended. Due to increased emphasis on assessment practices and how assessment can inform teaching and learning, a well designed study that examines the effects of LiPS

(Lindamood & Lindamood, 1998) delivered to a population of students deemed at-risk, may yield a wealth of practical implications for practice. By targeting the population whose reading skills are not developing at a typical rate, practitioners could explore additional instructional factors that influence learning to read and the rate at which that happens.

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